force upon driving element **12** that is then sensed by sensing element **14**. Sensed data is then compared with the stored data values to determine correspondence during calibration. Adjustments can be made as desired.

In operation, the fixed electrodes on the three sections of the lower portion of first mass **18** (see FIGS. **1** and **2**) receive a first drive voltage, followed by a second drive voltage being supplied to the fixed electrodes on the three sections of the upper portion of first mass **18**. The first and second drive voltages alternately supplied to the lower and upper portions of first mass **18** cause a movement or oscillation of suspended shuttle mass **20** in the y-axis. Thus, application of a driving voltage such as for example, a voltage alternately applied to a first side **26** (see FIG. **2**) of first mass **18** and then a second side **28** of first mass **18** causes an oscillatory motion of shuttle mass **20** in the y-axis. With the application of the alternating driving voltage, suspended shuttle mass **20** and its associated fingers move with respect to first mass **18** and its the associated fingers and any rotational force about the z-axis of motion sensor **10** causes driving element **12** to move along the x-axis.

In response to the rotational force, sensing mass **40** induces translation of moving electrode **36** relative to stationary electrodes **34** and **34'** for generating a change in capacitance. The movement of shuttle mass **20** in the x-axis generates a differential capacitance change in sensing element **14** that is proportional to the angular rate of rotation. The differential capacitance change is detected and converted to a voltage through an integrated device (not shown).

In a preferred embodiment, the first natural frequency is substantially different relative to the second natural frequency, or the characteristics of the respective components are otherwise tailored to avoid having consequential motion from sensing element **14** to feed back to driving element **12**, or vice versa. Preferably, the first natural frequency differs relative to the second natural frequency by at least about 10%. More preferably, the first natural frequency differs relative to the second natural frequency by at least 15 to 20 percent (%).

The skilled artisan will appreciate that motion sensor **10** can be tuned as desired using any suitable technique. For instance, one or a plurality of variable dummy masses **66** and **66'** (see FIG. **1**) can be modified or substituted as desired to achieve the desired result. Likewise, the spring constant of any linkage or spring may be varied as desired, as may the number or size of electrodes or the magnitude of the electrical forces applied.

The sensors may be made using micromachining, microelectronic fabrication techniques, or other semiconductor fabrication techniques. Further, though certain components are depicted as an integrated structure (e.g., the sensing element **14**), the elements may include separate structural units affixed to or integrated with a common or different suitable substrate (e.g., a semiconductor substrate) or other surface. Likewise, where shown as separate structural units, it is contemplated that the units may be integrated in a unitary structure. Moreover, stationary and moving functions may be interchanged among elements staying within the scope of the present invention. Further, similar results may be obtained using suitable combinations of moving components absent a stationary component, where the components move relative to each other.

The skilled artisan will appreciate the variety of different types of motion that the present sensor is capable of detecting, including but not limited to a variety of angular motions (such as pitch, roll, yaw or a combination of some or all), as well as certain linear motions. In the preferred embodiment, motion sensor **10** detects the yaw of a moving object and as such, may be employed in a transportation vehicle, such as an automobile. Motion sensor **10** may be used in the vehicle braking system, the cornering or steering system, the passive restraint system, the airbag deployment system, the power train system or any other system where a motion sensor is required.

By now it should be appreciated that the motion sensor of the present invention is particularly suitable for sensing yaw in the presence of a Coriolis force. In embodiments where the driving element and the sensing element are separate components, the motion decoupling of the two masses helps to reduce a source of noise. The motion sensor also affords substantial flexibility for tuning and frequency selection for the driving element and the sensing element. Moreover, the overall construction lends the device well to the ability to electronically correct imbalance due to manufacturing tolerances without generation of substantial undesirable signals. Sensors of the present invention can be made according to a wide range of performance specifications. For instance, in automotive applications the sensor is capable of achieving a resolution of about 0.1 deg/sec, a drift of about 0.01 deg/sec and a bandwidth of 60Hz, or a combination of these characteristics.

What is claimed is:

**1**. A yaw rate motion sensor, comprising:

a driving element having a first axis for oscillating generally in a direction of the first axis upon application of a driving voltage;

a sensing element for sensing a relative difference in a capacitance occasioned from the driving element upon application of a Coriolis force induced by an angular rotation; and

linkage for translating a motion from the driving element to the sensing element;

wherein the linkage is adapted for driving a driving mass of the driving element at a first natural frequency of the driving mass;

wherein the linkage is adapted for driving a sensing mass of the sensing element at a natural frequency that is at about the same frequency as the first natural frequency of the driving mass;

wherein the first natural frequency of the driving mass and the natural frequency of the sensing mass are selected to minimize feedback from the sensing element to the driving element.

**2**. The yaw rate motion sensor of claim **1**, wherein the driving element and the sensing element each include a plurality of fingers.

**3**. The yaw rate motion sensor of claim **2**, wherein the plurality of the fingers of the driving element and the sensing element are interdigitated relative to one another.

**4**. A yaw rate motion sensor, comprising:

a driving element having a first axis for oscillating generally in a direction of the first axis upon application of a driving voltage;

a sensing element for sensing a relative difference in a capacitance occasioned from the driving element upon application of a Coriolis force induced by an angular rotation; and

linkage for translating a motion from the driving element to the sensing element;

wherein the driving element and the sensing element each include a plurality of fingers;